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ABSTRACT

This paper presents arguments for greater use of sophisticated research strategies and statistical analyses of data in dealing with the real-life complexity of social interaction. Three possible procedures are proposed and illustrated in a study of interactions between mothers and their 8- to 18-month-old children. The first strategy is to operationalize complex concepts and define loose constructs behaviorally and quantitatively (e.g. maternal responsiveness.) The second general research strategy is to analyze static complexity. It is suggested that a wide range of variables be measured in the same investigation and that rather than computing individual correlations between variables, multivariate statistical analyses should be performed. This method of analysis would serve to uncover broad patterns of behavior which would more likely reflect the complexity of human nature. The third general research strategy suggested involves examining behavior patterns and mother-child relations as they change over time. This strategy calls for a longitudinal design and the use of cross-lagged panel correlation. (BRT)

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DEALING WITH THE COMPLEXITY OF MOTHER-CHILD INTERACTION

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No one denies that human interaction is complex. But while giving lip service to that notion, in the past researchers most often pursued simplistic investigations, reducing complexity by ignoring relevant variables, making global ratings, examining behavior at only one moment in time, and so on. We now know that if we are ever to understand the nature of human interaction in general, or the mother-child relation in particular, more sophisticated research strategies -- which take account of the real-life complexity of social interaction -- are necessary. And judging by the sizable number of papers and symposia at this conference that are addressing these issues, such strategies are being formulated. No doubt a host of new methods, procedures, and techniques will emerge. The present paper suggests just three, and illustrates their use in a recent study of interactions between mothers and their 8-18 month old children (SRCD Monograph #153, 1973)

1. The first strategy is that of operationalizing complex concepts -- that is, of defining loose, fuzzy, or global concepts behaviorally and quantitatively. There are many concepts in the literature on mother-child interaction -- like "interaction" itself, or "warmth", "sensitivity", "sociability", "appropriateness", "effectiveness" -- that are undoubtedly real components of human behavior, but which have ambiguous or unspecified meanings. Unless there is agreement about what they mean and about how they are translated into concrete behaviors, consensus among observers, let alone between investigators, is problematic.

The sloppy but significant concept I have selected to use in illustrating how this strategy might be applied is "maternal responsiveness". This is currently a popular variable, and one posited by some psychologists as the critical dimension of maternal care. But can one just go out and observe "responsiveness"? I suggest that one cannot -- at least not in that form. The concept must first be defined behaviorally. Of course there are many ways of doing that -- at least as many

as there are researchers -- and I offer for illustration just one.

Critical to this definition was that the measure be based on continuous and contingent interaction between mother and child. The first step was, therefore, to devise a scheme for observing and recording the simultaneous and sequential behaviors of mother and child. The economically feasible and observationally practical scheme arrived at involved using 2-columned stenographers notebooks in which observers wrote short abbreviations for particular kinds of behavior as the behaviors occurred. The mother's behaviors were recorded in the left column, the child's in the right; simultaneous behaviors on the same line, sequential behaviors on alternate lines. Thus the record showed interactive or reciprocal sequences of maternal and child behaviors. The observer also noted on the record 10-second intervals at the sound of a beeper, so there was a temporal dimension to the record, as well. The maternal and child behavior units thus recorded included such discrete behaviors as looks, smiles, shows, takes, touches, holds, and so on -- behaviors that were on a non-inferential level and one of high inter-observer reliability.

The second step was to code the recorded observations to produce a responsiveness measure. The general plan was to transform the observations into a table of contingencies: that is, when the child did a certain specific behavior, what did the mother do within the next 10 or 20 seconds? Rather than doing complete contingency tables for every possible combination of maternal and child behaviors, since we were just interested at this point in getting some measure or measures of maternal responsiveness, we took some shortcuts. First, from all the infant behaviors that had been recorded, we selected a set that were clearly expressive or signal behaviors -- like smiles, vocalizes, cries, or makes a vocal or gestural demand. Then, on the basis of reason and common sense, we decided which particular maternal behaviors, when they followed each of these expressive behaviors, would

qualify as "responsive". For example, when the child cried or fretted because he had been physically hurt, it seemed reasonable that appropriate responsive maternal behaviors would be: comes to the child, holds, hugs, kisses, physically soothes, or attends to the hurt. If the child called the mother, appropriate responses were: comes to the child, looks at or speaks to the child. And so on, for the entire set of expressive child behaviors selected. In general, responsive maternal behaviors were limited to those that were positive and clearly elicited by the child's behavior. The maternal consequents of each recorded occurrence of the selected infant behaviors were thus examined and scored to get measures of the proportion of these infant behaviors to which the mother made some (immediate, appropriate) response.

The third step was to combine these specific proportions into more general measures of responsiveness. The question then was, maternal responsiveness to what? It seemed sensible, in view of how the concept had been used in the literature, to make one measure a combined score of responses to all expressive child behaviors. But that ignored the possibility that some mothers might respond instantaneously every time the infant cried, but would ignore social signals like smiling and vocalizing. Therefore, we calculated two other measures: responsiveness to distress and demand and responsiveness to social expressions, by combining scores for behavior in these categories.

Thus we ended up with a concept that has some general connotative meaning for most of us, interpreted and translated by one investigator, and operationalized into a quantitative measure that could be used in further analyses and other investigations. This strategy of operationalizing concepts can be and was also fruitfully applied to other concepts like maternal warmth, effectiveness, rejection, and so on -- in order to bridge the gap between specific measurable behaviors that observers can agree on, and more abstract or general concepts that have greater theoretical significance, utility, and meaningfulness.

2. But defining and quantifying behavioral concepts is only one step in the process of dealing with the complexity of mother-child interaction. A second general research strategy I have labelled analyzing "static" complexity. There has been in the past, if not still, a tendency for each investigator to include in his research only a relatively small number of variables -- out of convenience or theoretical persuasion. Thus one investigator would measure maternal warmth (however he defined it) and correlate it with infant crying; another would assess parental discipline and relate it to cognitive development; a third, would concern himself with the relation between maternal warmth and children's IQ. And quite possibly, all these investigators would find significant correlations. Fallacious debates about who was right, about whether kids' intellectual development is related to maternal warmth or to parental discipline, have sometimes ensued, or at least been implied, in the literature. One attempt to resolve such debate involved viewing discipline in an emotional context and therefore including both discipline and warmth in subsequent investigations. The second general research strategy I am proposing is an extension of that kind of attempt. It suggests that in studying mother-child interaction, a wide range of maternal and child variables -- tapping as many aspects of behavior as possible -- be measured in the same investigation. And that rather than looking at individual correlations between variables, these measures then be submitted to multivariate statistical analyses, in order to uncover broad patterns of behavior which would more likely reflect our complex human natures.

Again, this was a strategy used in the present study. A great number of variables were included, measured in different settings and using varied procedures. They tapped the child's cognitive skills, exploration, social and emotional behavior , and language development; they included the mother's age, verbal IQ, talkativeness, knowledge about child development, attitude toward the child, and her emotional, physical, controlling, and playful behavior with the child. These measures were submitted to multivariate statistical procedures which reduced

them to a much smaller number of variables and which reflected empirically related patterns of behavior. The technique used was factor analysis, which was performed for maternal and child variables separately.

Factor analysis is not the only or necessarily the best multivariate procedure that can be applied to the study of mother-child interaction. But it demonstrated one very significant result in this study. When all the child variables were factor analyzed, one very powerful factor appeared, that subsumed all the measures of children's competence. It included measures of object permanence and schema development, mature play with toys, language comprehension and production, the Bayley Mental Test score, and the child's attachment, positive emotion, looking, and vocalizing to the mother. When maternal variables were analyzed in the same way, again it turned out that all the behaviors previous investigators had suggested were part of "good mothering" formed one complex factor. We called this factor "optimal maternal care" -- and it included looking at and talking to the child, being responsive to distress and social expressions, playing with objects, appropriateness or effectiveness of behavior with objects, expressing positive affect and suppressing negative affect. It is almost needless to say that when a second multivariate analysis, namely regression analysis, was performed on maternal and child factor scores together, these two patterns of child competence and optimal maternal care were found to be most highly and significantly related . So it's easy to see how controversies between investigators who examined different variables or sets of variables could arise. The point to be made here is that of course investigators can measure a couple of isolated variables and get a significant correlation, but they can say nothing about the relative importance of that relationship unless it is viewed in the context of the whole complex pattern of maternal care and child behavior.

3. Now even if investigations do include complex multivariate analyses of wide arrays of representative variables, as long as they're examined simultaneously, that only probes the static complexity of mother-child interaction. There's a very important dimension missing, and that is development or change. The third general research strategy I'd like to describe, therefore, is one which attempts to probe this dynamic complexity. It involves examining behavior patterns and mother-child relations as they change over time. The first step in the quest for cause-and-effect or directional influences is a longitudinal design -- not necessarily a lifelong longitudinal design, but one which assesses the mother-child interaction at at least two points in time. The second step of the strategy is to analyze observations of the interaction as it changes from time 1 to time 2. A statistical technique that is useful for such analysis is the cross-lagged panel correlation.

When maternal and child behaviors are both measured twice, this leads to 4 sets of variables. The correlations between simultaneous maternal and child variables at either time, are the contemporaneous correlations; correlations between maternal or child variables across time are the autocorrelations. The third kind of correlation is between maternal variables at one time and child variables at the other. These are the cross-lagged correlations. They are useful because if the two cross-lagged correlations for any pair of maternal and child behaviors when compared are significantly different from each other, this suggests that the temporal relation implied by the larger correlation coefficient is the causal direction. That is, if you want to know whether the mother's behavior is causing the child's or vice versa, you can examine these pairs of correlations, and if the correlation between a maternal behavior at time 1 and a child behavior at time 2 is significantly greater than the opposite cross-lagged correlation, that is, between the child's behavior at time 1 and the maternal behavior at time 2, then the logical inference is that that maternal behavior is influencing the child's development more than the reverse. This is only the first step in the

process: the rest involves consideration of other plausible causal hypotheses and elimination of those for which there is no statistical evidence, primarily by examining the other correlations involved. It is difficult to describe these manipulations briefly, and I refer you once more to the monograph for a fuller description, examples, and references.

To illustrate the usefulness of the cross-lagged correlation procedure, I shall just mention that when the data in the study of mother-child interaction in 8-18 month old children were thus analyzed, two suggestive and interesting patterns of influence in the mother-child relation appeared. One pattern was related to children's intellectual development. It seems that, at least over the period from 11 to 17 months, certain maternal behaviors, namely verbal and social stimulation, positive emotion, contingent responsiveness to social behavior (although not to distress), and the amount of time mother spends playing with the child, have a positive effect on the child's overall intellectual development. When we examined the pattern of relations for children's social behaviors (looking, smiling, vocalizing), however, a different pattern of influence was suggested. In this area, it was clear that the child was the causal agent. The more he smiled, vocalized, or looked at his mother, at 11 months, the more positive, attentive, and responsive was she 6 months later. This clearly demonstrates the dynamic reciprocity of mother-child interaction.

In 1978, I suspect, our consciousnesses have been sufficiently raised that everyone acknowledges that mother-child interaction is complex, dynamic, and bi-directionally reciprocal. The more research we do, the more we discover how truly complex. Let us be challenged, not dismayed, by that complexity, and continue to look for and to apply new and sophisticated research methods to augment our understanding of the complexity of mother-child interaction.